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Research Article

Metalacurbs foordi sp. nov., a new Lacurbsinae (Opiliones, Laniatores, Biantidae) from Ankasa National Park, Ghana

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Abstract

Despite being one of the most conspicuous African opilionids, the members of Lacurbsinae remain one of the least known groups of harvestmen species. All eight previously-known species of Lacurbsinae are inadequately described and poorly illustrated, leaving the morphological characteristics of this subfamily obscure. After more than half a century, we describe a new species of Lacurbsinae. *Metalacurbs foordi* **sp. nov.** is described, based on a male specimen collected in Ankasa National Park, Ghana, with a detailed description and illustration of its external and genital morphology. This marks the first modern taxonomic description of a species within Lacurbsinae, including an illustration and description of the male genital morphology, a crucial modern taxonomic characteristic for Opiliones and represents a starting point for the taxonomic revision of the subfamily.

Key words: Afrotropical Region, genitalia, harvestmen, taxonomy, new species

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Introduction

There are many African nations with fewer described Opiliones species than might be expected, given their large number of ecoregions and the rich biodiversity of this arachnid order in the continent. This pattern is particularly remarkable in certain parts of tropical Africa, where there are huge and rich humid forests, but much of the Opiliofauna is undescribed. The Republic of Ghana is one of these countries with only 16 opilionid records (Kury et al. 2024). These low numbers contrast with the 41 species in the neighbouring Republic of Côte d'Ivoire, the 31 species of the much smaller Republic of Equatorial Guinea or the more than 200 species recorded in the Republic of South Africa (Kury et al. 2024).

Roewer (1949) described *Eulacurbs paradoxa* Roewer, 1949 and *Prolacurbs singularis* Roewer, 1949, from Aburi, in the Eastern Region of south Ghana and, to date, these remain the only representatives of Biantidae in the country. These two species belong to the small and poorly-known subfamily Lacurbsinae Lawrence, 1959. Thanks to the collection effort of our friend and colleague Dr Bernhard Huber, head of the Arachnida Section and Curator of the Zoologisches

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Forschungsmuseum Alexander Koenig in Bonn, Germany, we had the opportunity to study one Lacurbsinae specimen from the Western Region of south Ghana, which results in a new species that we describe and illustrate in this work.

Materials and methods

The specimen examined for this work was borrowed from the Zoologisches Forschungsmuseum Alexander Koenig (ZFMK), Bonn, Germany (Bernhard A. Huber, Head of Arachnida Section and Curator).

The specimen was examined using a Leica M205A stereomicroscope and different focal plane pictures were taken with a Leica DF295 digital camera. Illustrations were performed on a Leica M165C stereoscopic microscope with a *camera lucida*. Male genitalia were prepared using glycerine as a clearing agent following Acosta et al. (2007) and were drawn using a *camera lucida* attached to an Olympus BH2 microscope. Morphological nomenclature follows Kury and Pérez-González (2007), Gnaspini and Rodrigues (2011), Kury and Medrano (2016) and Wolff et al. (2016). Measurements are given in millimetres (mm). Descriptions of colours follow Kury and Orrico (2006) using the standard names of the 267 Colour Centroids of the NBS/IBCC Colour System (http://people.csail.mit.edu/jaffer/Color/Dictionaries#nbs-iscc). Drawings were vectorised and plates were prepared in CorelDRAW Graphics Suite 2023 (24.3.0). The distribution map was created by SimpleMappr (Shorthouse 2010).

Taxonomy

Opiliones Sundevall, 1833
Laniatores Thorell, 1876
Biantidae Thorell, 1889
Lacurbsinae Lawrence, 1959
***Metalacurbs* Roewer, 1915**

***Metalacurbs foordi* sp. nov.**
https://zoobank.org/BA6B8F87-B420-41F2-B99A-0D45FC8D6EAF
Figs 1–7

Material examined. Type material: *Holotype*: GHANA • 1 ♂; Western Region, Ankasa National Park; [5.2172, -2.6514]; 180 m a.s.l.; 22 Feb 2013; B.A. Huber *leg.*; forest near entrance, day collecting; (ZFMK Op835).

Etymology. Patronym in honour of our dear and long-time good friend, the late Stefan Foord (1971–2023), in recognition of a productive, passionate and dedicated life to the research and development of African Arachnology; name in the genitive case.

Diagnosis. The new species can be easily distinguished not only from the other species in the genus, but also from all species of Lacurbsinae by the presence, in males, of basally enlarged metatarsus II (Fig. 4D) and a dorsal spiniform apophysis on femur IV (Fig. 6A–D). Only *Metalacurbs oedipus* (Roewer, 1958) and *Metalacurbs villiersi* (Roewer, 1953) exhibit a tibia IV stout and enlarged as in *Metalacurbs foordi* sp. nov., but the tibia IV outline and armature are completely different amongst these three species (compare Fig. 6A–C, E versus Roewer 1953: 620, fig. 5 and Roewer 1958: 236, fig. 4).

Figure 1. *Metalacurbs foordi* sp. nov., holotype male (ZFMK Op835), habitus photos **A** dorsal view **B** ventral view **C** ventral view with detail of coxae I–III **D** ventral view with detail of coxa IV and free sternites **E** lateral view **F** posterior view **G** detail of free tergites I–III and anal operculum. Black arrows indicate spiniform apophyses. Scale bars: 1 mm (**A, B, E**); 500 µm (**C, D, F, G**).

Description. Male holotype (ZFMK Op835). Body measurements: Total body length 2.78, carapace length 0.73, ***scutum magnum*** length 2.30, carapace maximum width 1.14, abdominal ***scutum*** maximum width 1.81. Appendage measurements in Table 1.

***Dorsum*:** Outline with a theta (θ) shape, campaniform (bell-shaped) (Figs 1A, 2A). Carapace wider than long, with a small and rounded frontal hump; anterior

Table 1. Appendage measurements (in mm) of *Metalacurbs foordi* sp. nov., holotype male (ZFMK Op835). Tr–Trochanter, Fe–Femur, Pa–Patella, Ti–Tibia, Mt–Metatarsus, Ta–Tarsus, T–Total.

	Tr	Fe	Pa	Ti	Mt	Ta	T
Pedipalp	0.34	1.88	1.29	0.86	–	0.55	**4.92**
Leg I	0.31	1.30	0.48	1.01	1.76	1.07	**5.93**
Leg II	0.42	2.77	0.76	2.13	3.22	2.45	**11.76**
Leg III	0.35	1.68	0.53	1.22	2.31	1.26	**7.35**
Leg IV	0.63	2.97	0.86	2.42	2.43	1.57	**10.88**

border slightly convex (Figs 1A, 2A). Cheliceral sockets not marked (Fig. 2A). Eyes separated, eye mounds high along the mid-line of the carapace; interocular area is smooth with a small transversal elevation (Figs 1A, E, 2A). Carapace straight in lateral view (Fig. 1E). Abdominal ***scutum*** convex in lateral view (Fig. 1E). Sulcus I deep and well-marked, in dorsal view medially slightly curved to posterior body region (Fig. 2A). Mesotergal areas defined; sulci II–V notably wide, shallow and complete (Figs 1A, 2A). Mesotergal area I larger than mesotergal areas II–IV (Figs 1A, 2A). Mesotergal areas I–II with two lateral tubercles; mesotergal area IV with two medial tubercles; tubercles of mesotergal area II longer than tubercles of mesotergal areas I and IV; mesotergal area III with two medial long spiniform apophyses (Figs 1A, E, F, 2A). Mesotergal area V with a row of five small pointed tubercles (Figs 1G, 2A). Lateral borders of abdominal ***scutum*** with a row of rounded granules, but at level of posterior mesotergal area II and anterior mesotergal area III with larger tubercles (Figs 1A, 2A). Free tergite I with a row of six tubercles, with the two most lateral tubercles longer than medial ones; free tergite II with a row of seven tubercles; free tergite III with a row of lateral tubercles and one medial spiniform apophysis [broken] (Figs 1A, E–G, 2A).

***Venter*:** Coxa I with setiferous granules (Fig. 1B, C); anterior and posterior borders of coxa III with a row of granules connecting with coxae II and IV, respectively; posterior granules of coxa III larger than anterior granules (Fig. 1B–D); free sternites with a row of setiferous granules (Fig. 1D, F, G); anal operculum with two small tubercles (Fig. 1E–G). Spiracles not concealed (Fig. 1D).

Chelicerae*:** Basichelicerite unarmed, with an elongated and slightly marked ***bulla (Fig. 2B). Cheliceral hand with sparse setae and rounded frontal setiferous granules (Fig. 2B, C). Fixed and movable finger with a row of conical teeth (Fig. 2C).

***Pedipalps*:** Raptorial, with spines concentrated on tibia and tarsus (Fig. 2D, E). Coxa elongated, slightly shorter than basichelicerite; proximally with one dorsomesal and one dorsoectal granule; ventrally with small granules (Figs 1A–C, 2A). Trochanter rounded. Femur straight; ventrally with a row of four proximomedial pointed tubercles and one mesal spine in the third proximal region (Fig. 2D–F). Patella elongated ventrodistally with one ectal pointed tubercle and one mesal spine (Fig. 2D, E). Tibia ventrally with four ectal spines followed by a pointed setiferous tubercle (Fig. 2E) and three mesal spines (Fig. 2D). Tarsus shorter than tibia; ventrally armed with two ectal and two mesal spines (Fig. 2D, E). Claw elongated and pointed (Fig. 2D).

***Legs*:** Coxa IV with prolateral pointed setiferous tubercles and two spiniform apophyses, one distal and one subdistal (Figs 1A, B, D, F, 2A). Trochanter II with

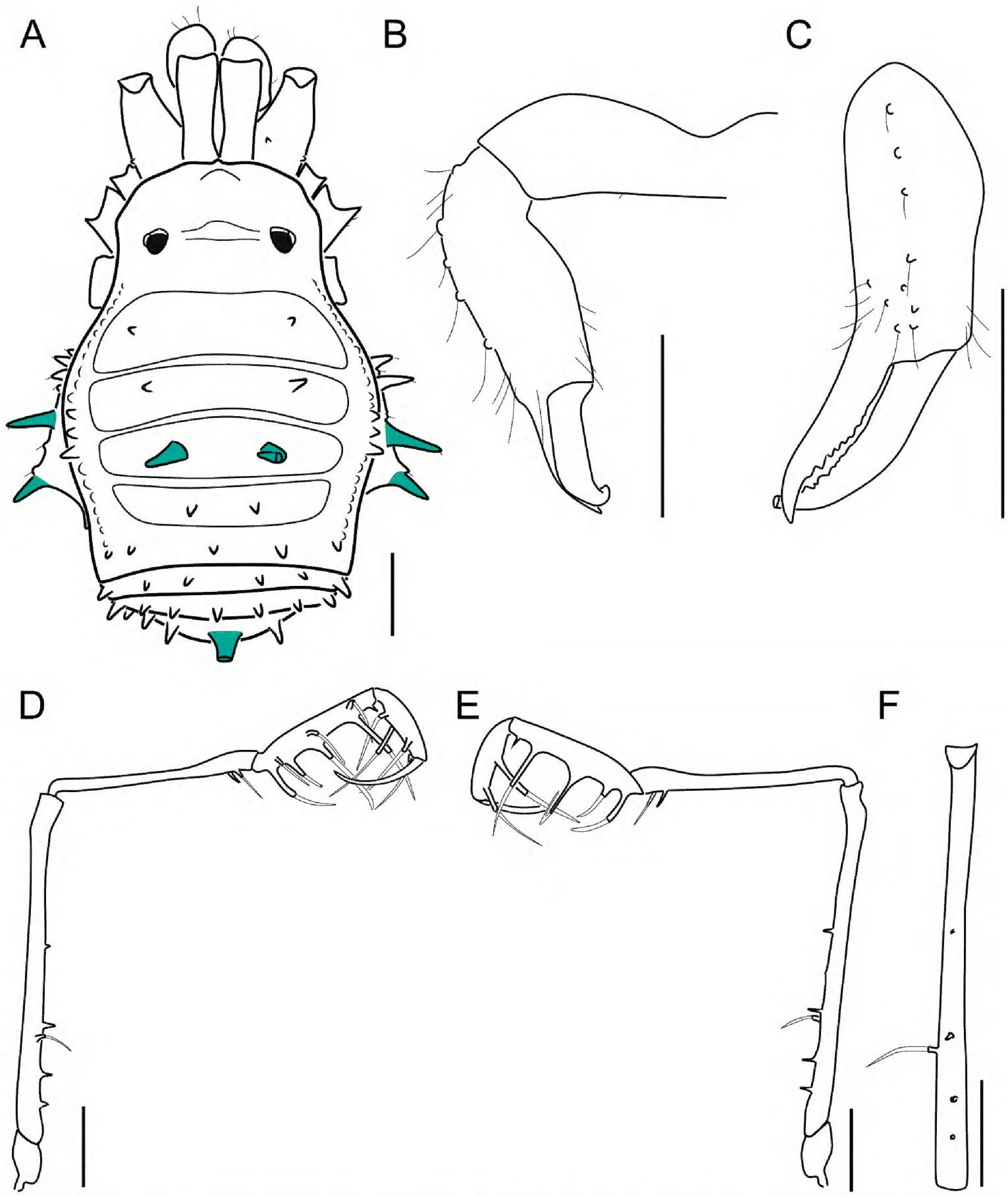

Figure 2. *Metalacurbs foordi* sp. nov., holotype male (ZFMK Op835), drawings of habitus, chelicera and pedipalp **A** habitus, dorsal view **B, C** left chelicera **B** ectal view **C** frontal view **D–F** left pedipalp **D** mesal view **E** ectal view **F** femur, ventral view. Spiniform apophyses in green. Scale bars: 500 µm.

one dorsal tubercle (Fig. 4A, B); trochanter IV apically with one retrolateral and one prolateral spiniform apophysis (Figs 1F, 6A–D). Femur I unarmed (Fig. 3A, B); femur II with a dorsal row of short tubercles (Fig. 4B); femur III with a row of longer dorsal pointed tubercles than in femur II (Fig. 5B); femur IV distally slightly thickened, armed with longitudinal rows of pointed tubercles on all surfaces; ventrodistal tubercles longer; dorsally with one spiniform apophysis at the beginning of the distal third and one spiniform apophysis on the distal edge; ventrally with a prolateral subdistal spiniform apophysis (Fig. 6A–D). Patellae I–II unarmed (Figs 3A, B, 4A, B); patella III with dorsal tubercles, the most distal longer and sharp-pointed (Fig. 5A–C); patella IV with sharp-pointed tubercles, the most distal tubercles longer (Fig. 6A–E). Tibiae I–II unarmed (Figs 3C, 4C); tibia III with a dorsoproximal tubercle (Fig. 5C); tibia IV ventrally enlarged, dorsally with four proximal tubercles, followed by small tubercles decreasing in size, distally with a prolateral and retro-

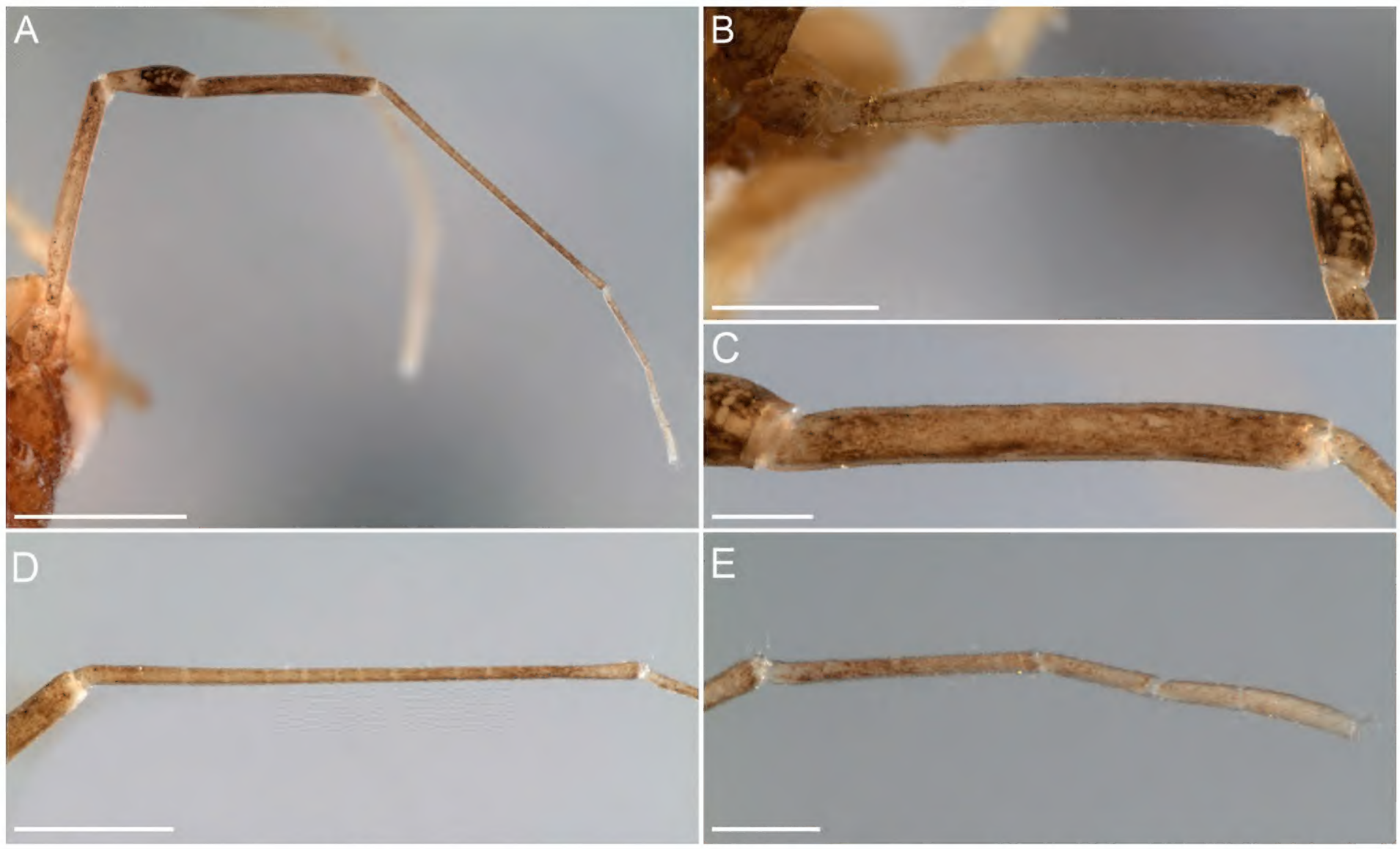

Figure 3. *Metalacurbs foordi* sp. nov., holotype male (ZFMK Op835), right leg I, photos **A** retrolateral view **B** detail of trochanter, femur and patella **C** detail of tibia **D** detail of metatarsus **E** detail of tarsus. Scale bars: 1 mm (**A**); 500 µm (**B, D**); 200 µm (**C, E**).

Figure 4. *Metalacurbs foordi* sp. nov., holotype male (ZFMK Op835), right leg II, photos **A** retrolateral view **B** detail of trochanter, femur and patella **C** detail of tibia **D** detail of metatarsus **E** detail of tarsus. Arrow indicates the proximally swollen metatarsus II. Scale bars: 1 mm (**A, D**); 500 µm (**B, C, E**).

Figure 5. *Metalacurbs foordi* sp. nov., holotype male (ZFMK Op835), right leg III, photos **A** retrolateral view **B** detail of trochanter, femur and patella **C** detail of tibia **D** detail of metatarsus **E** detail of tarsus. Scale bars: 1 mm (**A**); 500 µm (**B–D**); 200 µm (**E**).

lateral pointed tubercle; ventral surface with a row of prolateral tubercles increasing in size, followed by a curved, strong and pointed prolateral apophysis and by a short conical and blunt-tipped apophysis; ventrodistally with two retrolateral short blunt-tipped apophyses (Fig. 6A–C, E). Metatarsi I and III thin and unarmed, with pseudoarticular rings (Figs 3D, 5D); metatarsus II unarmed, proximally swollen (obclavate) and distally thin with pseudoarticular rings (Fig. 4D); metatarsus IV proximally broadened, ventroproximally with conical tubercles; dorsoproximally with three pointed tubercles (Fig. 6A–C, F). Tarsi III–IV with a dense scopula (Figs 5E, 6G). Tarsal formula: 4(2):9–10(3):5:6 (Figs 3E, 4E, 5E, 6G).

Colour (specimen preserved in 80% ethanol): General body appearance yellowish-brown; carapace and coxae I–III with dark reticulations; mesotergal areas I–IV, lateral border of ***scutum magnum***, posterior border of area V and free tergites I–III darker; posterior border of stigmatic area and free sternites dark yellowish-brown (Fig. 1A–G); lighter colouration at the level of cheliceral insertion, creating a false appearance of a marked cheliceral socket; pseudoarticular rings lighter (Fig. 1A). Appendages light yellowish-brown (Fig. 1A); trochanters I–IV, distal portion of femora I–IV, patellae I–IV and tibiae IV with dark brown reticulations (Figs 3A, B, 4A, B, 5A, B, 6C–E); tibia I–III, proximal portion of metatarsi II, IV dark brown (Figs 3C, 4C, D, 5F, 6F).

Genitalia*:** General shape of penis tubular (Fig. 7A, E) apically enlarged (Fig. 7C, D), making the ***pars basalis and ***pars distalis*** clearly defined (Fig. 7C). ***Pars distalis*** with a ventral enlarged, rounded and laterally compressed portion, that connects to a ventral thin and wide ***lamina apicalis***; the junction between these two regions forms a semicircular edge (Fig. 7D). ***Lamina apicalis*** with a dorsal pseudotubular-shaped

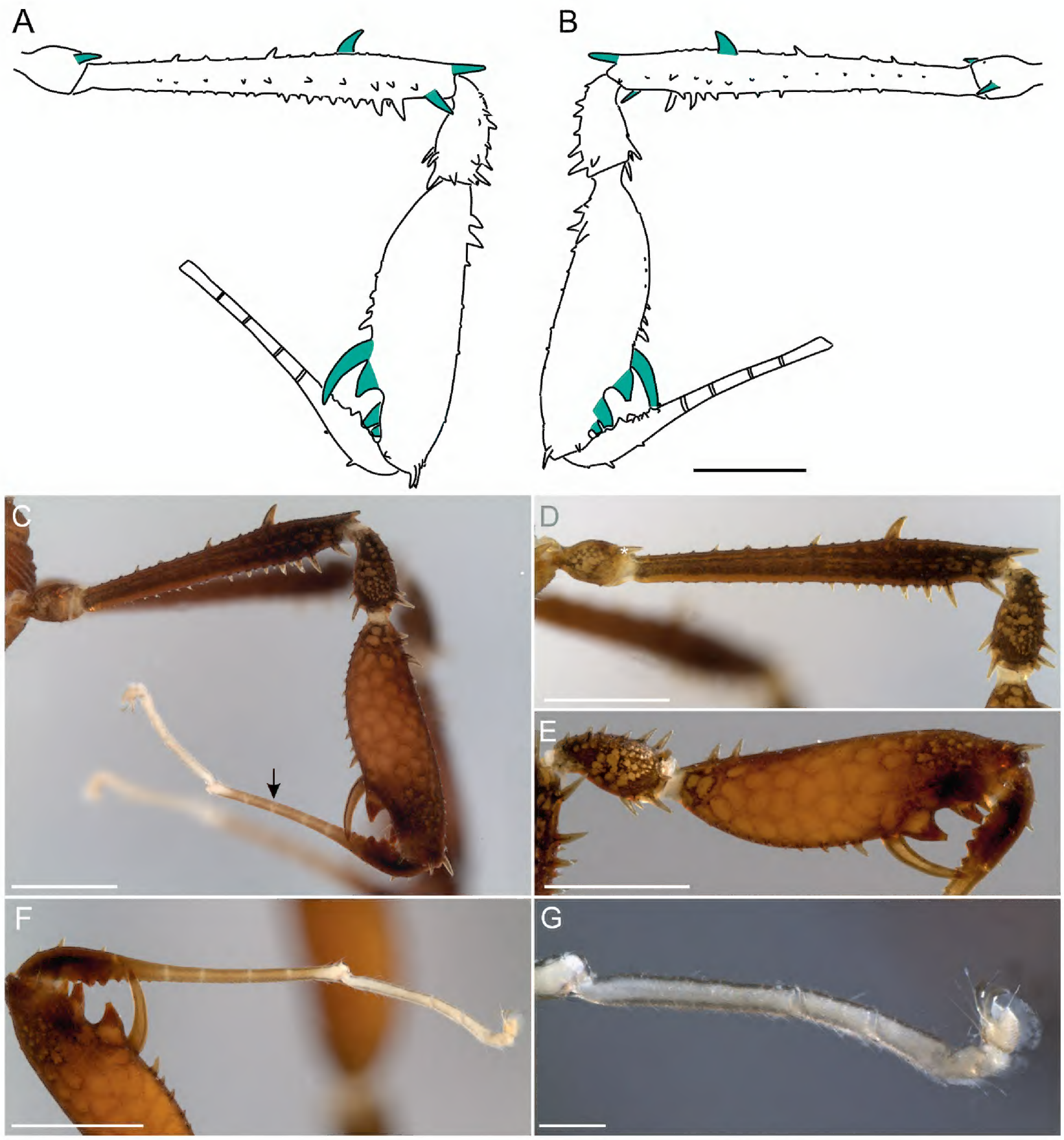

Figure 6. *Metalacurbs foordi* sp. nov., holotype male (ZFMK Op835), drawings and photos of left leg IV **A** prolateral view **B** retrolateral view **C** prolateral view **D** detail of trochanter, femur and patella **E** detail of tibia **F** detail of metatarsus **G** detail of tarsus. Spiniform apophysis in green. Arrow indicates a pseudoarticular ring. Scale bars: 1 mm (**A–C**); 500 µm (**D–F**); 200 µm (**G**).

fold (Fig. 7B, D); ***lamina apicalis*** with two ventral pairs of small and acute macrosetae (Fig. 7F). ***Pars distalis*** with a basal pair of lateral small and acute macrosetae, pointed to the apical region, located just below the narrow-rounded portion (Fig. 7D). Narrow-rounded portion of ***pars distalis*** with two ventral and one ventrolateral pair of small, acute macrosetae (Fig. 7F). Glans with basal ***capsula externa*** articulated with the truncus and with a jack-knife movement during the hydraulic expansion. ***Capsula externa*** as a rigid sclerite (similar to the ***stragulum*** in Zalmoxoidea) with two long and curved projections basally fused; apically, each projection with an enlarged laminar portion tapering to a pointing end, extending laterally over the rounded portion of the ***pars distalis*** (Fig. 7A, D); dorsally with a wide mediobasal cleft (leaving part of the ***capsula interna*** exposed) becoming mediodistally very narrow so that the curved projections are in contact (Fig. 7B). ***Capsula interna***, barely visible through transparency, rigid, with a stylus and conductors largely fused, only

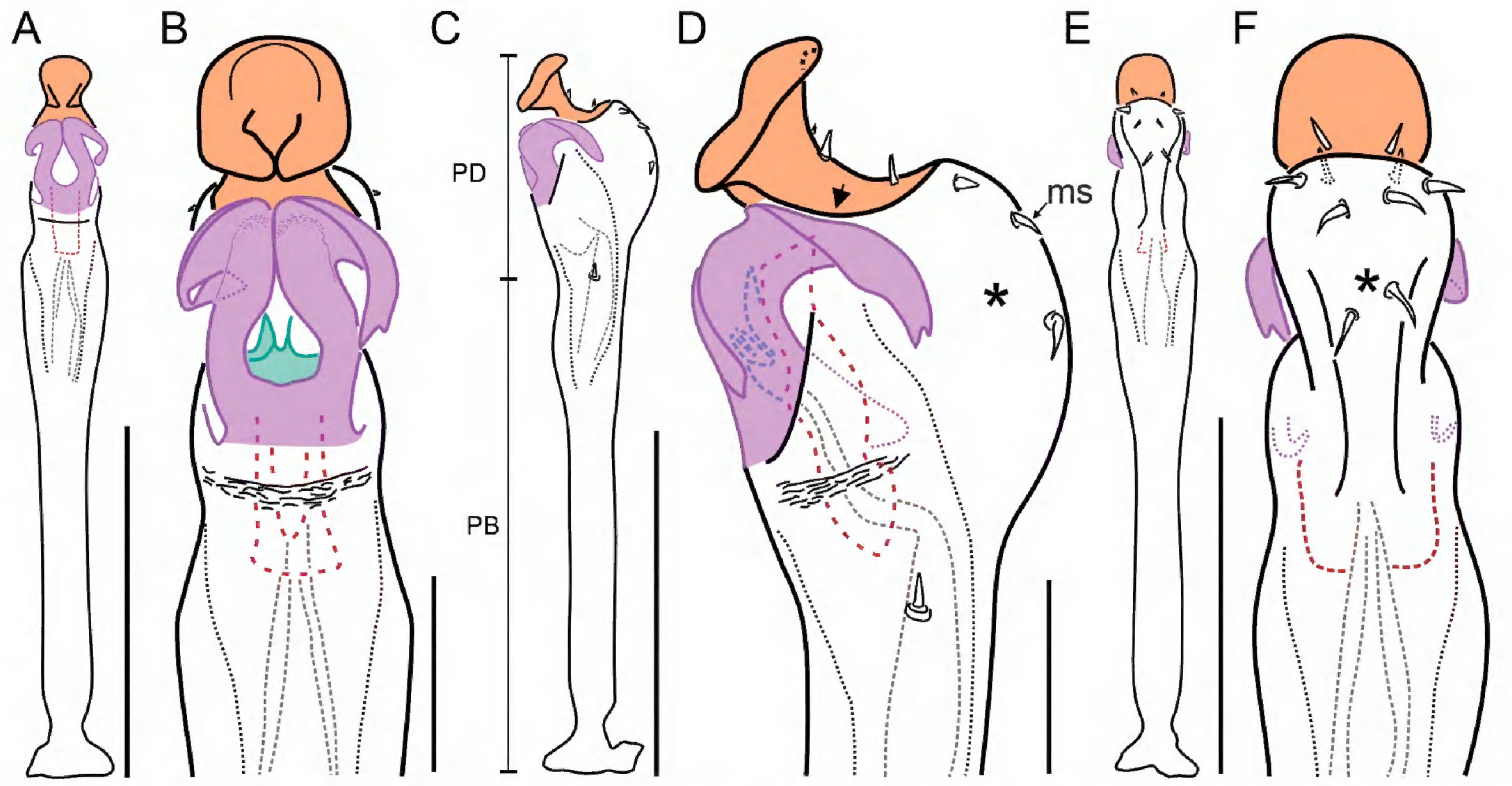

Figure 7. *Metalacurbs foordi* sp. nov., holotype male (ZFMK Op835), penis drawings **A, B** dorsal view **C, D** lateral view **E, F** ventral view. *Lamina apicalis* in orange; *Capsula externa* in magenta; conductors in red (dashed line); stylus in green (solid and dashed line). Abbreviation: PB (*pars basalis*), PD (*pars distalis*), ms (macroseta). Arrow indicates the semi-circular edge formed by the junction between *lamina apicalis* and the narrow-rounded portion of *pars distalis*. Asterisk indicates the narrow-rounded portion of *pars distalis*. Scale bars: 500 µm (**A, C, E**); 100 µm (**B, D, F**).

separated at the apical end; conductors with straight apical margin; stylus pointed with a subapical opening of ***ductus ejaculatorius*** (Fig. 7B, D).

Female. Unknown.

Distribution. Known only from the type locality (Fig. 8).

Discussion

Metalacurbs foordi sp. nov., is the ninth species known of the small biantid subfamily Lacurbsinae. Lacurbsinae has a fuzzy taxonomic history since its very beginning. It was cryptically proposed by Lawrence (1959) when dealing with the Biantinae fauna of Madagascar, without detailed explanations or proper taxonomic treatment. Lawrence (1959) just cited the type genus, made reference to the number of tarsomeres of leg I and referred to the possibility that the genus *Lacurbs* Sørensen, 1896, could be segregated in its own subfamily Lacurbsinae, which was enough for the subfamiliar nomen to become available (Kury 2018). It seems as though Lawrence was not fully convinced about his proposal because, shortly after, Lawrence (1965) did not recognise his own subfamily and referred to the lacurbsines as the "*Lacurbs* group" (within Biantinae). After that, the name Lacurbsinae was largely ignored until it was resurrected by Kury (2003), but without further definitions or explanations. Only Kury and Pérez-González (2007) highlight some Lacurbsinae morphological features in a general Biantidae characterisation and include the subfamily in a dichotomous key. Therefore, Lacurbsinae remains poorly characterised and defined. A taxonomic revision of all the genera and previous species is needed.

The present contribution is a starting milestone in this goal and represents the first time a Lacurbsinae species has been described under modern standards as well as the first time male genitalia have been properly characterised in this subfamily. Regarding the external morphology, lacurbsines are a cohesive group that could be easily recognised from other Biantidae, mainly by the

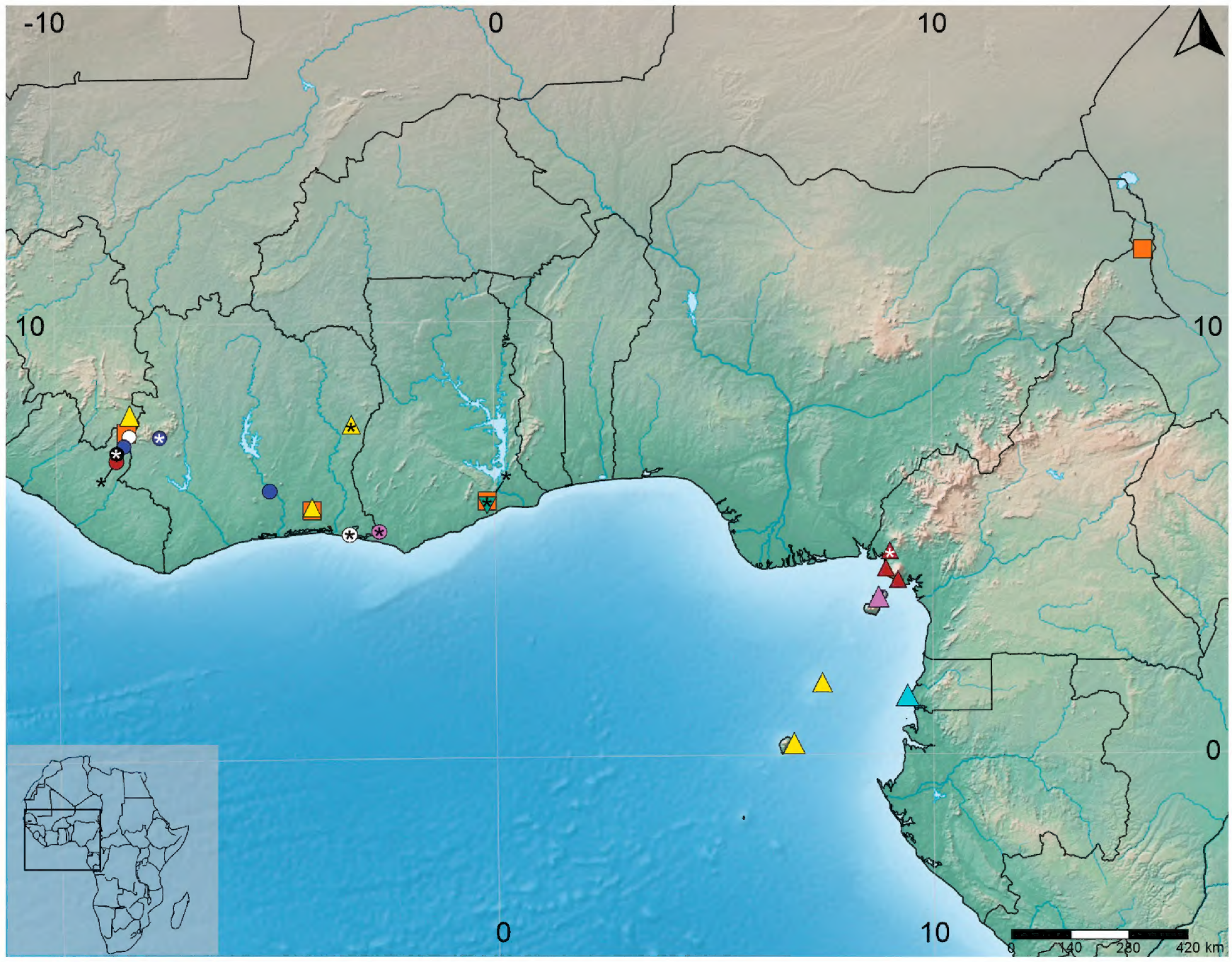

Figure 8. Geographical distribution of Lacurbsinae. *Eulacurbs paradoxa* (orange square). *Lacurbs* (triangles): *Lacurbs nigrimana* (yellow), *L. spinosa* (red), *L. fernandopoensis nomen nudum* (magenta), *Lacurbs* sp. (bright-cyan). *Metalacurbs* (circles): *Metalacurbs cornipes* (black), *M. foordi* sp. nov. (magenta), *M. oedipus* (red), *M. simoni* (white), *M. villiersi* (blue). *Prolacurbs singularis* (green inverted triangle). Asterisks indicate the type localities.

combination of an abdominal ***scutum*** which is much wider in the middle with convergent posterior margins and a tibia and metatarsus IV heavily armed and/or swollen in males (Kury and Pérez-González 2007).

The male genital morphology is distinctive in lacurbsines and remarkably different from other biantids. The ***pars distalis*** morphology and glans hydraulic functioning convergently share some similarities to those of Zalmoxoidea. First, the ***capsula externa*** does not exhibit the typical biantinae soft titillators (e.g. Martens 1978) and is modified in a rigid sclerite similar to the ***stragulum*** in Zalmoxoidea. This rigid ***capsula externa*** also appears in other biantids such as Antillean Stenostygninae (e.g. Alegre et al. 2019; Alegre-Barroso and Pérez-González 2024) and the Mexican *Stygnomma teapense* Goodnight & Goodnight, 1951 (obs. pers.). Second, the ventral ***pars distalis*** is tagmatised, also similar to those in Zalmoxoidea. It ends in a thin ***lamina apicalis*** dorsally folded that somewhat resembles the zalmoxoidean ***rutrum*** and basally with a kind of rounded ***pergula***. The complex ***pergula/rutrum*** somewhat resembles those of *Phalangodella* sp. and *Hevelia crucis* Kury, García and Ahumada-C., 2023. The ***capsula interna*** in *Metalacurbs foordi* sp. nov. is also rigid and basally fused with the ***capsula externa***. Once the glans (i.e. ***capsula externa*** + ***capsula interna***) are conformed by rigid sclerites, the only way of functioning during the hydraulic expansion is unfolding the ***capsula externa*** from the truncus as a jack-knife to expose

the ***casula interna*** with the stylus, similar to the mode of function in Zalmoxoidea (e.g. Kury and Pérez-González 2002). That means that the jack-knife movement of the glans in *Metalacurbs foordi* sp. nov. is completely different from the typical "in-out of truncus" expansion movement in biantines (see Martens 1978, 1986). In fact, the markedly different glans structure and mode of function during the hydraulic expansion of *Lacurbs* and *Metalacurbs* was pointed out by Martens (1978) to justify the exclusion of both genera from his Biantidae concept.

Unfortunately, none of the previous lacurbsine species has been re-described to date and their penial morphology still remains unpublished. Given this context, we refrain from a critical assignment of the new species to a lacurbsine genus, considering also the male genital morphology. Instead, we follow the traditional approach and include the new species in the genus *Metalacurbs* because of its major congruence (excepting only the armature of free tergite II) with this genus according to Lawrence's (1965) dichotomous key. Therefore, the combination under *Metalacurbs* adopted herein is merely tentative. Further taxonomic and systematic studies are needed in order to provide stronger evidence for generic allocation of the new species described.

Lacurbsines, to date, are restricted to western tropical Africa (Fig. 8). They are recorded mainly from continental localities (Sørensen 1896; Roewer 1912, 1915, 1923, 1949, 1953, 1958, 1959; Lawrence 1947, 1965; Staręga 1992), with particularly high sympatry in Mount Nimba, but also on islands, as is the case of *Lacurbs nigrimana* Roewer, 1912, in the Democratic Republic of São Tomé and Príncipe (Roewer 1927) and *Lacurbs fernandopoensis* ***nomen nudum*** in Bioko (Fernando Po during the colonial era), Republic of Equatorial Guinea (Andrés Cobeta 2001; Santos and Prieto 2010). The geographic distribution of the subfamily exhibits enormous distributional gaps where no lacurbsines are recorded. It is highly probable that new species will be detected once lacurbsines specimens from these areas are studied.

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Additional information

Conflict of interest

The authors have declared that no competing interests exist.

Ethical statement

No ethical statement was reported.

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Author contributions

Both authors have equal contribution in this article.

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Data availability

All of the data that support the findings of this study are available in the main text.

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